Remarks/Arguments

Claims 19-63 are pending in the Application.

Claims 19-63 stand rejected.

I. PROVISIONAL OBVIOUSNESS-TYPE DOUBLE PATENTING REJECTIONS

In Paper No. 9, the Examiner has provisionally rejected the claims 19-22, 26-33 and 36-38 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over renumbered claim 16 of co-pending United States Patent Application Serial No. 09/787,473. Applicant traverse these rejections. However, to facilitate prosecution of the Application, Applicant hereby respond with the enclosed Terminal Disclaimer to moot these provisional rejections.

II. REJECTIONS UNDER 35 U.S.C. §§ 102(a) AND 103(a) OVER *CHEN*

The Examiner has rejected Claims 19-63 under 35 U.S.C. § 102(a) as being anticipated by Chen *et al.,* "Chemical attachment of organic functional groups to single-walled carbon nanotube material," *Journal of Materials Research*, Vol. 13, No. 9, Sept. 1998, pp. 2423-2431 ("*Chen*"). Paper No. 9, at 2. In the alternative, the Examiner has rejected Claims 19-63 under 35 U.S.C. § 103(a) as obvious over *Chen.* Paper No. 9, at 2.

Applicant respectfully traverses these rejections.

A. Rejections Under § 102

Anticipation requires each and every element of the claim to be found within the cited prior art reference.

Regarding the rejections of Claims 19-63 under 35 U.S.C. § 102(a) as being anticipated by *Chen*, Applicant notes that although *Chen* has attempted reactions with single-wall carbon nanotubes, *Chen* is, at best, speculating as to the attachment of functional groups to the single-wall carbon nanotubes. Repeatedly, throughout *Chen*, are numerous statements that attest to such speculation. Specifically, *Chen* is unable to determine if the carbon nanotubes were functionalized due to the impure nature of the single-wall carbon nanotube material and the large amount of amorphous carbon attached to the tube walls. Six examples of citations in *Chen* that

show that *Chen* was unsure as to whether the nanotubes were functionalized or not are given below.

(1) "All of the reactions provide evidence for the chemical attachment to the SWNTM's, [single-wall carbon nanotube material] but because of the impure nature of the star[t]ing materials, we are unable to ascertain the site of reaction. In the case of dichlorocarbene, we are able to show the presence of chlorine in the SWNT bundles, but as a result of the large amount of amorphous carbon that is attached to the tube walls, we cannot distinguish between the attachment of dichlorocarbene to the walls of the SWNT's and reaction with the amorphous carbon." (*Chen*, in Abstract, p. 2423.)

(2) "A layer of amorphous carbon may be seen to cover a substantial fraction of the surface of the SWNT's in HRTEM and the presence of this material in intimate contact with the SWNT bundles considerably complicated our analysis of the chemical reaction products. Thus, while we had hoped to carry out the chemistry on the walls of the SWNT's, we are unable to rule out competing reactions with extraneous material in the samples." (*Chen*, Col. 1, par. 5, p. 2425.)

(3) "If chemical addition to the tube wall occurs in an ordered fashion, narrow, weak lines are expected in the Raman and IR spectra, depending on the symmetry and fraction of the tubes that have been functionalized. No new sharp lines are observed above the noise in the spectra." (*Chen*, Col. 2, par. 1, p. 2428.)

(4) "The complicating factor is the presence of amorphous carbon on the walls of the SWNT. Thus we cannot say whether the chlorine is associated with the walls of the SWNT's or the amorphous carbon that is present on the walls at the start of the reactions." (*Chen*, Col 1., par. 5, p. 2429.)

(5) "The Raman and IR spectrum are consistent with small changes in the structure of the SWNT's, but do not unequivocally demonstrate that the dichlorocarbene or Birch reductions have actually modified the walls of the SWNT's. It seems that the bulk of the SWNT's are untouched by the chemical treatment." (*Chen*, Col. 1, par. 6, p. 2429.)

(6) "In conclusion, our results are consistent with the addition of chemical functionalities to the surface of the SWNT bundles, but we cannot distinguish between attachment to the walls

of the SWNT's and attachment to the amorphous carbon that is present on the walls in current samples."

Examiner is reminded that the entire *Chen* reference, including the statements of Chen identified above must be considered when making a rejection. MPEP 2141.02 ("Ascertaining the differences between the prior art and the claims at issue requires interpreting the claim language, and considering both the invention and the prior art references as a whole.") Accordingly, Examiner may not dismiss the admittedly speculative nature of the *Chen* reference.

These citations in *Chen* serve to illustrate that, although *Chen* had hoped to functionalize the SWNT, *Chen* repeatedly admits no certainty in actually accomplishing that result. Furthermore, it is unreasonable to expect that the carbene species of *Chen* migrated through the amorphous carbon layers that so thoroughly coated the SWNTM of *Chen*. Thus, *Chen* was not in possession of sidewall functionalized single-wall carbon nanotubes.

Affirming Applicant's position that *Chen* was not in the possession of sidewall functionalized/derivatized single-wall carbon nanotubes, Hirsch and co-workers point out in Exhibit A [Holzinger *et al.*, Angew. *Chem. Int. Ed.*, **2001**, *40*, 4002-4005 ("*Holzinger*")], that "direct chemical functionalization of the [carbon nanotube] side walls using addition reactions, of which direct fluorination and subsequent nucleophilic substitution, and the addition of aryl radicals formed by the reduction of aryl diazonium salts are the only procedures reported to date." (*Holzinger*, p. 4002, col. 1) The direct fluorination and subsequent nucleophilic substitution to which *Holzinger* refers is Applicants' own work, and the addition of aryl free radicals to which *Holzinger* refers is the subject of commonly-assigned International Patent Application No. WO 02/060812 having a priority date *after* the presently claimed invention.

Therefore, as a result of the foregoing, Applicant respectfully requests that the Examiner withdraw his rejection of Claims 19-63 under 35 U.S.C. § 102(a) as being anticipated by *Chen*.

B. Rejections Under § 103

Regarding the rejections of Claims 19-63 under 35 U.S.C. § 103(a) as being obvious over *Chen*, Applicant again respectfully traverses these rejections.

To establish a *prima facie* case of obviousness, at least three basic criteria must be met. First, there must be some suggestion or motivation, either in the reference itself or in the knowledge generally available to one of ordinary skill in the art, to modify the reference.

Second, there must be a reasonable expectation of success. Finally, the prior art reference must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on Applicant's disclosure. *In re Vaeck,* 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991); *see also* M.P.E.P §§ 2143-2143.03.

All three of these basic criteria are missing here.

1. There is no suggestion or motivation to modify the teachings of *Chen* to arrive at the presently claimed invention

As noted above, *Chen* reads inconclusively as to whether or not the desired sidewall functionalized single-wall carbon nanotubes were even produced. Numerous citations in *Chen* point to their inability to determine whether the carbon nanotubes were functionalized. Chen fails to present even a method by which they could effectively ascertain whether their carbene reactions with SWNTs produce sidewall derivatized SWNTs. Thus, there is no motivation to modify the processes of *Chen* to produce sidewall functionalized single-wall carbon nanotubes.

2. There is no reasonable expectation of success, were there a suggestion or motivation to modify the processes of *Chen*, that the derivatized single-wall carbon nanotubes of the presently claimed invention could be produced

Chen's admissions that "...SWNT's are not very reactive..." (*Chen*, Col. 1, par. 2, p. 2424.) and "...the nondestructive attachment of functional groups presents a further challenge to experiment..." (*Chen.*, Col. 1, par. 1, p. 2424) are indicative of the difficult nature of the chemistry. Their uncertainty as to the nature of their own product, as outlined in the six citations above, suggests that they did not reasonably expect even their own method to succeed. Thus, there is no reasonable expectation of success in modifying the method of *Chen*.

3. *Chen* fails to teach all the claimed limitations of each of Claims 19-63

As above, *Chen* does not teach sidewall functionalized single-wall carbon nanotubes. *Chen* likewise fails to teach all the elements in the claims, such as, for example, the ratio of substituents to carbon on the sidewall of the nanotubes and the identity of various specific substituents. Thus, *Chen* does not teach or suggest all the claim limitations of each of the claims.

As discussed above, *Chen* does not produce sidewall derivatized single-wall carbon nanotubes, and it is acknowledged in the art that the Applicants of the present invention were the

first to derivatize the sidewalls of single-wall carbon nanotubes (*Holzinger*) and that as late as 2001, carbene reactions were not considered a viable method for sidewall derivatization of single-wall carbon nanotubes. *Chen* provides no suggestion or motivation to modify its processes to produce side-wall derivatized single-wall carbon nanotubes. There is no reasonable expectation of success that, were the processes of *Chen* actually modified, they would produce sidewall derivatized single-wall carbon nanotubes. Finally, *Chen* fails to teach all the claimed limitations of each of Claims 19-63. Consequently, none of the three basic criteria recited above for establishing a *prima facie* case of obviousness have been met in rejecting any of Claims 19-63. Accordingly, Applicant respectfully requests the Examiner withdraw the rejection of Claims 19-63 under 35 U.S.C. § 103(a) as being unpatentable over *Chen*.

CONCLUSION

As a result of the foregoing, it is asserted by Applicant that the remaining Claims in the Application are in condition for allowance, and respectfully request allowance of such Claims.

Applicant respectfully requests that the Examiner call Applicant's attorney at the below listed number if the Examiner believes that such a discussion would be helpful in resolving any remaining problems.

RESPECTFULLY SUBMITTED,

WINSTEAD SECHREST & MINICK P.C.

Attorneys for Applicant

By: _____

Ross Spencer Garsson
Reg. No. 38,150
P.O. Box 50784
Dallas, Texas 75201
(512) 370-2870